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EXAMINER	
BROOME, SAID A	

ART UNIT	PAPER NUMBER
2628	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/748,235	MAILLOT, JEROME	
	Examiner	Art Unit	
	SAID BROOME	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 February 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20 and 22-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *11-20,22,24-26,31,34 and 35* is/are allowed.

6)☒ Claim(s) *1-10,23,27-30,32,33 and 36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This office action is in response to an amendment filed on 4/30/2007.

2. Claims 1, 10-12, 16, 18-21, 23-26 and 33-36 have been amended by the applicant.

3. Claims 2-4, 6, 7, 13-15 and 17 are original.

4. Claims 5, 8, 9, 22 and 27-32 have been cancelled.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-10, 32 and 33 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In regards to claim 1, the following claim language in lines 7-8 pertaining to "a program used for displaying the original mesh on a display by a computer using the first and second tessellations.", as well as in regards to the claim language recited in lines of claim 32: "a program used for displaying the original mesh on a display by a computer using the bounding mesh and the tessellation mesh.", was not described in the originally filed specification, therefore claims 1-10, 32 and 33 are rejected under 35 U.S.C. 112 first paragraph for providing new matter to the claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 23, 27-30 and 36 are rejected under 35 U.S.C. 102(b) as being anticipated by Sachs (US Patent 6,021,358).

Regarding claim 23, Sachs describes a method of intersection (Fig. 33) determining where bounding polyhedrons or polygons bound and are tightly constrained to a mesh model with a tessellation (col. 16 lines 14-15 - 24-29), using the polyhedrons or polygons tessellation to automatically determine an intersection order of one or more intersections between a line and the mesh model (col. 16 lines 1-5 - 54-62); and one of displaying the intersection on a display (col. 24 lines 64-65) and storing the intersection in a storage (col. 16 line 1).

Regarding claims 27-30, Sachs describes a method of determining a ray-object intersection, where there has been a first intersection between a ray and a mesh object (Fig. 33), and where the ray or the mesh object move relative to the other (Fig. 23: element 108 enables ray to move relative to surface point of mesh object), finding, based on the first intersection, a second intersection between the ray and the mesh object based on the moving of the ray or the mesh object (col. 16 lines 1-5 - 54-62, Fig. 14), where several intersection between a ray and a mesh objects are determined, therefore a second or subsequent intersection is determined. Sachs also describes after the finding, determining whether the second intersection is occluded or

intersected along the ray by the mesh object using a tessellation constrained to the mesh model (col. 15 lines 50-53 - col. 20 lines 33-48); and one of displaying the intersection on a display (col. 24 lines 64-65) and storing the intersection in a storage (col. 16 line 1).

Regarding claim 36, Sachs describes a method of automatically finding an intersection with an original mesh surface (column 15 lines 50-53), finding an intersection with the original mesh surface by using an outer bounding surface and a tessellation between the outer bounding surface and the original mesh surface (column 16 lines 13-17); one of displaying the intersection on a display (column 24 lines 64-65) and storing the intersection in a storage (column 16 line 1).

Allowable Subject Matter

Claims 11-20, 22, 24-26, 31, 34 and 35 are allowed. The following is an examiner's statement of reasons for allowance:

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claims 11-17. In regards to claim 11, Yamrom teaches a method of using a volatile or non-volatile computer readable media or storage unit finding an intersection with a mesh object (col. 1 lines 46-48). Glassner illustrates finding an intersection with the surface of an original mesh surface (Fig. 2). Glassner also teaches determining an intersection by using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5). However, none of the prior art teaches or suggests storing a data structure for an original mesh surface that is provided with a bounding surface bounding the mesh surface and is provided with a tight inner surface, the data structure comprising: a first tessellation linking the tight

inner surface to the original mesh surface; and a second tessellation linking the bounding surface to the tight inner surface, therefore claims 11-17 are allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claims 18, 24 and 35. Yamrom teaches finding an intersection with a mesh object (col. 1 lines 46-48). Glassner illustrates finding an intersection with the surface of a three dimensional object (Fig. 2). Glassner also teaches determining an intersection by using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), and a surface that is bounded by the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests a first tessellation linking the tight inner surface to the original mesh surface and a second tessellation linking the bounding surface to the tight inner surface.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claim 19. Yamrom teaches finding an intersection with an orignial mesh object (col. 1 lines 46-48). Glassner illustrates finding an intersection with the surface of a three dimensional object (Fig. 2). Glassner also teaches determining an intersection by using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), and a surface that is bounded by the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests finding an intersection with the original mesh surface by using an outer bounding surface, a tight inner surface that is both bounded by the outer bounding surface and wraps the original mesh surface and a tessellation between the inner bounding surface and the outer bounding surface, wherein the finding of the intersection with the original mesh surface is performed according to an intersection with the outer bounding surface; and one of displaying the intersection on a display and storing the intersection in a storage.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claim 20. Yamrom teaches finding an intersection with a mesh object (col. 1 lines 46-48). Glassner illustrates finding an intersection with the surface of a three dimensional object (Fig. 2), and also teaches determining an intersection by using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), with a surface that is bounded by the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests finding of the intersection with the original mesh surface is performed according to an intersection with the outer bounding surface, and wherein the tight inner surface comprises a convex hull, wherein there is a first tessellation between and linking the convex hull with the outer bounding surface, and wherein the finding further comprises traversing a path form the intersection with the outer bounding surface through the second tessellation to an intersection with the convex hull surface, and traversing from the intersection with the convex hull surface through the first tessellation to thereby find the intersection with the original mesh surface; and one of displaying the intersection on a display and storing the intersection in a storage.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claims 25. Yamrom teaches finding an intersection with a mesh object (col. 1 lines 46-48), Glassner illustrates finding an intersection with the surface of a three dimensional object (Fig. 2), and teaches determining an intersection by using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), where a surface that is bounded by the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests determining whether a polyhedron or polygon intersected by the line one of contains and is an outermost intersection with the line based on whether such polyhedron or polygon is on a convex hull

surface of the mesh model using a tessellation linking the mesh model and the convex hull, further comprising identifying the polyhedron or polygon by traversing polyhedrons or polygons that intersect the line; and one of displaying the intersection on a display and storing the intersection in a storage.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claim 26. Yamrom teaches finding an intersection with a mesh object (col. 1 lines 46-48), and Glassner illustrates finding an intersection with the surface of a three dimensional object (Fig. 2), and teaches determining an intersection by using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), with a surface that is bounded by the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests determining whether a polyhedron or polygon intersected by the line one of contains and is an outermost intersection with the line based on whether such polyhedron or polygon is on a convex hull surface of the mesh model using a tessellation linking the mesh model and the convex hull, further comprising traversing to a next polyhedron or polygon when a traversed polyhedron or polygon is inside an interior or convex region of the mesh model; and one of displaying the intersection on a display and storing the intersection in a storage.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claim 31. Yamrom teaches finding an intersection of a ray with an original mesh surface (col. 1 lines 46-48). Glassner teaches determining an intersection by using an outer bounding surface of a mesh object (pg. 61 2nd col. 4th ¶ lines 1-5), and a surface that is bounded by the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests a detecting movements of the ray or the object, one relative to the

other, and for some of the movements: when the ray intersects the mesh object at a local neighbor of a face of the mesh object, determining whether intersection of the ray with the mesh object is occluded by the mesh object by traversing polygons not part of the mesh object; and when the ray does not intersect the mesh object at a local neighbor of a face of the mesh object, finding an intersection of the ray with the mesh object by traversing polygons intersected by the ray, where the polygons are not part of the mesh object and include at least one polygon of a bounding surface bounding the mesh object; and one of displaying the moved intersection on a display and storing the moved intersection in a storage, as recited in claim 31.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claim 34. Yamrom teaches finding an intersection with an original mesh surface between a ray and the mesh surface (col. 1 lines 46-48). Glassner teaches finding an intersection with the surface of a three-dimensional object, as illustrated in (Fig. 2), and also teaches determining an intersection by using an outer bounding surface on (pg. 61 2nd col. 4th ¶ lines 1-5), and a surface that is bounded by the outer bounding surface (Fig. 3). Glassner also teaches traversing adjacent intersected polygons or polyhedrons, (Fig. 3), starting from a first intersection until an intersection is found (pg. 61 lft col. 6th ¶ lines 2-6 – rgt. col. 1st ¶ lines 1-2). However, none of the prior art teaches or suggests a first tessellation linking the convex hull to the original mesh surface, and a second tessellation linking the bounding surface to the convex hull, where the second tessellation tessellates a space between the bounding surface and the convex hull surface, and where the first tessellation tessellates a space between the convex hull surface and the original surface mesh, as recited in claim 34.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

Applicant's arguments filed 2/1/08 have been fully considered but they are not persuasive.

The objection to claims 11-17 has been withdrawn, and the claims are therefore indicated as allowable in the above Office Action.

The applicant requests withdrawal of the 35 U.S.C. 101 rejection of claims 1-10, 32 and 33 on pg. 11 3rd ¶ lines 1-6 of remarks, due to the amendments to the claims. However, the subject matter added in by the amendment to claims 1-10, 32 and 33 was not described in the originally filed specification, therefore claims 1-10, 32 and 33 are rejected under 35 U.S.C. 112 first paragraph for providing new matter to the claims in the above Office Action.

The 35 U.S.C. 112 second paragraph rejection of claims 24-26 has been withdrawn in view of the amendments to the claims.

The applicant argues on pg. 12 1st ¶ lines 3-5 that there is no need for Sachs just counts the number of intersections and does not determine the intersection order or rank of the intersections. However, claims 23 recites determination of an intersection order, in which Sachs therefore provides the order of intersections (col. 15 line 62 - col. 16 line 4) in which a

determination is clearly organized successively based on a count to list the generated intersections.

The applicant argues on pg. 12 2nd ¶ lines 6-8 that Sachs does not determine whether a second intersection is occluded and found the outermost intersection on an object or the one closest to the source of the ray. However, Sachs provides determination of objects intersected with rays used in occlusion testing (Fig. 14), in which several ray intersections or penetrations may be performed to determine the closet intersection of the ray with the outer surface of an object, thereby providing the outermost intersection.

The applicant argues on pg. 12 3rd ¶ lines 5-7 that Sachs does not teach finding, based on the first intersection, a second intersection between the ray and the mesh object based on the moving of the ray or the mesh object. However, Sachs clearly illustrates (Fig. 14) that a second intersection of surface 58 based on a first intersection of surface 56 in which the ray 60 is swept through the structure of an object.

The applicant argues on pg. 13 1st ¶ lines 2-3 that Sachs does not teach a tessellation that is between and can connect a surface of dimension to an outer bounding surface of dimension. However, Sachs teaches providing a tessellation used to determine surface of an object to be penetrated using a fabrication tool (col. 15 lines 24-27, col. 16 line 54 - col. 17 line 3 and col. 20 lines 51-58), therefore the tessellation is defined within the connected outer bounding surface to carve out the shape of the intended object.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SAID BROOME whose telephone number is (571)272-2931. The examiner can normally be reached on M-F 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571)272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ulka Chauhan/
Supervisory Patent Examiner, Art Unit 2628

/Said Broome/
Examiner, Art Unit 2628